High-Order Central WENO Schemes for Multi-Dimensional Hamilton-Jacobi Equations

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Abstract

We present new third- and fifth-order Godunov-type central schemes for approximating solutions of the Hamilton-Jacobi (HJ) equation in an arbitrary number of space dimensions. These are the first central schemes for approximating solutions of the HJ equations with an order of accuracy that is greater than two. In two space dimensions we present two versions for the third-order scheme: one scheme that is based on a genuinely two-dimensional Central WENO reconstruction, and another scheme that is based on a simpler dimension-by-dimension reconstruction. The simpler dimension-by-dimension variant is then extended to a multi-dimensional fifth-order scheme. Our numerical examples in one, two and three space dimensions verify the expected order of accuracy of the schemes.

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